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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/520,011	12/29/2004	Walter Musial	NREL-01-51	6976
7590 03/04/2008 Paul J White Senior Patent Counsel National Renewable Energy Laboratory 1617 Cole Boulevard Golden, CO 80401				
EXAMINER GUTIERREZ, ANTHONY				
ART UNIT		PAPER NUMBER		
2857				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/520,011

Applicant(s)

MUSIAL ET AL.

Examiner

ANTHONY GUTIERREZ

Art Unit

2857

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 December 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-8508)
- Paper No(s)/Mail Date _____

- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-5 and 9-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Davidson et al. (US 6,601,456 B1).

As to claims 1, 10, and 11, Davidson et al. discloses an apparatus for applying at least one cyclical load to a specimen (Abstract), the specimen extending at least along a longitudinal axis (Fig. 3, along the length of specimen 21), comprising: a mass (Fig. 3, 23a); and an actuator mounted to the specimen and operatively associated with said mass (col. 8, lines 17-27); and a control system operatively associated with said actuator (col. 9, lines 3-17).

Davidson further teaches that it may be necessary to measure and adjust the load forces on the fretting contact during fretting tests of a specimen in order to provide the proper forces. Since the contact of the fretting device is moved by a mass along a linear displacement path that is perpendicular to the longitudinal axis of the specimen, adjustment implies moving the mass along such path. (Col. 7, lines 13-29 and Fig. 3).

Davidson further teaches that the control system employs automatic control over actuators to adjust mechanical excitation of the test machine in order to ensure that fretting tests effects are properly tracked and feedback controlled for the sake of accurate measurements. Davidson teaches that this is beneficial in order to prevent an operator from having to perform excitation measurements and adjustments during fatigue tests (col. 8, line 50-col. 9, line 3).

Davidson further teaches that in variations in resonance can present a problem in maintaining uniform stress excitation, and thus it is beneficial to keep the frequency of excitation tuned to mechanical resonance frequency to maintain uniform oscillatory forces and motions of the specimen throughout the test (col. 8, lines 37-50).

Davidson et al. further teaches that said actuator moves said mass and that said control system operates said actuator to reciprocate said mass along the linear displacement path as the application of said actuator to said specimen (as addressed in the sections cited above) would cause the specimen to vibrate in such a way that the mass would move at least minimally up and down along the perpendicular axis. The reference teaches an apparatus capable of carrying out the intended use of the functional language of reciprocation at a reciprocating sinusoidal frequency, said reciprocating frequency being about equal to a resonance frequency of the specimen in a test configuration.

As to claim 2, in view of the reference as applied to claim 1 above, Davidson further teaches a feedback sensor operatively associated with said control system, said feedback sensor producing a feedback signal, said control system being responsive to

the feedback signal produced by said feedback sensor (col. 8, lines 50-58), said control system operating said actuator to change a displacement of said mass in response to said feedback signal by using strain gauges or accelerometers addressed with respect to the fretting contact mass (col. 7, lines 13-16).

As to claim 3, in view of the reference as applied to claim 2 above, Davidson further teaches that said feedback sensor comprises a strain gauge and wherein the feedback signal produced by said feedback sensor is related to a strain in the specimen (col. 7, lines 13-16).

As to claim 4, in view of the reference as applied to claim 2 above, Davidson further teaches that said feedback sensor comprises an accelerometer wherein the feedback signal produced by said feedback sensor is related to an acceleration of the specimen (col. 7, lines 13-16).

As to claim 5, in view of the reference as applied to claim 1 above, Davidson et al. further teaches a load frame mounted directly to the specimen, said actuator being mounted to said load frame (Fig 2, 25).

As to claim 9, in view of the reference as applied above, Davidson further discloses a static mass mounted to the specimen (Fig. 3, 23b).

As to claim 12, Davidson et al. discloses a method for vibrating a specimen (Abstract), the specimen extending at least along a longitudinal axis (Fig. 3, along the length of specimen 21), comprising: mounting a mass to the specimen so that said mass can be reciprocated along a linear displacement path that is perpendicular to the

longitudinal axis of the specimen (Davidson further teaches that it may be necessary to measure and adjust the load forces on the fretting contact during fretting tests of a specimen in order to provide the proper forces. Since the contact of the fretting device is moved by a mass along a linear displacement path that is perpendicular to the longitudinal axis of the specimen, adjustment implies moving the mass along such path (Col. 7, lines 13-29 and Fig. 3)). Davidson teaches reciprocating the mass along the linear displacement path at a reciprocation frequency that is about equal to a resonance frequency of the specimen in a test configuration. The application of the disclosed actuator (col. 8, lines 17-27) to said specimen would cause the specimen to vibrate in such a way that the mass would move at least minimally up and down along the perpendicular axis. These vibrations are disclosed to be maintained at the resonance frequency (col. 9, lines 10-17).

As to claim 13, in view of the reference as applied to claim 12 above, Davidson further teaches detecting a strain in the specimen and controlling a displacement of the mass to place a desired load on the specimen based on the detected strain (col. 7, lines 13-19).

As to claim 14, in view of the reference as applied to claim 12 above, Davidson further teaches detecting an acceleration of the specimen and controlling a displacement of the mass to place a desired load on the specimen based on the detected acceleration (col. 7, lines 13-19).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 7, 8, 12, and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miles et al. (US 6,732,591 B2) in view of Davidson et al. (US 6,601,456 B1).

As to claims 1, 7, 12, 15, and 17, Miles et al. discloses an apparatus for applying at least one cyclical load to a specimen (see Abstract which teaches that a control unit sends a signal to shaker 26 to maintain a high cycle load at resonant frequency), the specimen extending at least along a longitudinal axis (Fig. 1, along the length of specimen 12), comprising: a transverse load actuator operatively associated with a specimen, said transverse load actuator applying to the specimen a load in a transverse direction, said transverse direction being substantially orthogonal to the longitudinal axis of the specimen and to the linear displacement path (Fig. 1, 26, and col. 4, line 65-col. 5, line 13).

Miles et al. does not specifically disclose fretting testing via the additional claimed features.

Davidson et al., however teaches a mass (Fig. 3, 23a); and an actuator mounted to the specimen and operatively associated with said mass (col. 8, lines 17-27); and a control system operatively associated with said actuator (col. 9, lines 3-17).

Davidson further teaches that it may be necessary to measure and adjust the load forces on the fretting contact during fretting tests of a specimen in order to provide the proper forces. Since the contact of the fretting device is moved by a mass along a linear displacement path that is perpendicular to the longitudinal axis of the specimen, adjustment implies moving the mass along such path. (Col. 7, lines 13-29 and Fig. 3).

Davidson further teaches that the control system employs automatic control over actuators to adjust mechanical excitation of the test machine in order to ensure that fretting tests effects are properly tracked and feedback controlled for the sake of accurate measurements. Davidson teaches that this is beneficial in order to prevent an operator from having to perform excitation measurements and adjustments during fatigue tests (col. 8, line 50-col. 9, line 3).

Davidson further teaches that in variations in resonance can present a problem in maintaining uniform stress excitation, and thus it is beneficial to keep the frequency of excitation tuned to mechanical resonance frequency to maintain uniform oscillatory forces and motions of the specimen throughout the test (col. 8, lines 37-50).

Davidson et al. further teaches that said actuator moves said mass and that said control system operates said actuator to reciprocate said mass along the linear displacement path as the application of said actuator to said specimen would cause the specimen to vibrate in such a way that the mass would move at least minimally up and

down along the perpendicular axis. The reference teaches an apparatus capable of carrying out the intended use of the functional language of reciprocation at a reciprocating sinusoidal frequency, said reciprocating frequency being about equal to a resonance frequency of the specimen in a test configuration.

Davidson et al. further teaches that an advantage of the invention is that the invention permits fretting testing during the long term cyclic vibration tests (col. 2, lines 25-27).

It therefore would have been obvious to one of ordinary skill in the art at the time of invention to include fretting testing in the manner suggested by Davidson et al. with the fatigue testing disclosed by Miles et al., in order to provide more comprehensive tests over a given time thus increasing testing power.

As to claims 8 and 16, in view of the references as applied to claim 7 above, the combination of references suggests that the load applied to the specimen by said transverse load actuator would be varied at the reciprocating frequency in order to maintain constant mechanical resonance of the specimen, which is important for the reasons addressed above.

As to claim 18, in view of the reference as applied to claim 17 above, Davidson further teaches a feedback sensor operatively associated with said control system, said feedback sensor producing a feedback signal, said control system being responsive to the feedback signal produced by said feedback sensor (col. 8, lines 50-58), the modification addressed above would provide said control system operating said actuator to change a displacement of said mass in response to said feedback signal by

using strain gauges or accelerometers addressed with respect to the fretting contact mass (col. 7, lines 13-16).

As to claim 19, in view of the reference as applied to claim 18 above, Davidson further teaches said feedback sensor comprises at least one accelerometer (col. 7, lines 13-16).

As to claim 20, in view of the reference as applied to claim 18 above, Davidson further teaches said feedback sensor comprises at least one strain gauge (col. 7, lines 13-16).

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Davidson et al. (US 6,601,456 B1) in view of Goldenberg et al. (US 7,233,476 B2).

As to claim 6, in view of the reference as applied to claim 5 above, routine modification of Davidson et al. for the sake of automation suggest a linear actuator having a proximal end and a distal end, the proximal end of said linear hydraulic actuator being mounted to said load frame, the distal end of said linear hydraulic actuator being mounted to said mass so that the mass moves independently of the specimen.

Davidson et al. specifically teaches the use of piezoelectric actuators in the sections cited above. Davidson et al. does not specifically teach the use of hydraulic actuators.

Goldenberg et al. however teaches the use of hydraulic actuators as an alternative to piezoelectric actuators (col. 5, lines 45-54), as evidence that they are art related equivalents.

It therefore would have been obvious to one of ordinary skill in the art at the time of invention to use hydraulic actuators as taught by Goldenberg et al. in the invention of Davidson et al. in order to extend the applicability so that the invention can be performed without requiring more specific components.

6. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miles et al. (US 6,732,591 B2) in view of Davidson et al. (US 6,601,456 B1), still further in view of Au et al. (US 6,442,534 B1).

As to claim 21, the combination of references discloses the use of an actuator controller as addressed above.

The combination of references does not specifically teach that the controller is a PID controller.

Au et al. however, teaches that a PID controller can be beneficially for regulating different operating regimes of an actuator (col. 1, lines 36-50).

It therefore would have been obvious to one of ordinary skill in the art at the time of invention to include a PID controller as taught by Au et al. in the control system of the

combination addressed above, in order to provide enhanced facilitation of all sources of testing machinery leading away from resonant vibration.

Response to Arguments

7. Applicant's arguments with respect to claims 1-21 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 6,718,833 B2 to Xie et al. teaches a multiaxial high cycle fatigue test system.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY GUTIERREZ whose telephone number is (571)272-2215. The examiner can normally be reached on Monday to Thursday, 8:30 AM-7:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eliseo Ramos-Feliciano can be reached on (571) 272-7925. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2858

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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